NOTICE

All drawings located at the end of the document.

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PLAN FOR SOURCE EVALUATION AND PRELIMINARY PROPOSED MITIGATING ACTIONS FOR WALNUT CREEK WATER-QUALITY RESULTS

REVISION 2

September 15, 1997

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

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1. INTRODUCTION

This Plan for source evaluation and preliminary proposed mitigating actions is provided in accordance with the Final Rocky Flats Cleanup Agreement (RFCA) (Attachment 5, §2.4(B)) under "Action Determinations". This Plan addresses the August 15, 1997 Rocky Flats Environmental Technology Site (Site) report of elevated 30-day moving averages for plutonium (Pu) and americium (Am) water-quality results in Walnut Creek. As agreed to by letters from Mr. Steve Tarlton of Colorado Department of Public Health and the Environment (CDPHE) to Mr. Steve Slaten of Department of Energy, Rocky Flats Field Office (DOE RFFO), dated August 25, 1997 and from Mr. Tim Rehder of the Environmental Protection Agency (EPA) to Mr. Steve Slaten of DOE RFFO, dated August 27, 1997 this Plan contains the following: 1) elevated values measured at the Point of Compliance (POC) monitoring location at Walnut Creek and Indiana Street (referred to as GS03) for the period June 12, 1997 through July 2,1997; and 2) elevated values at the Point of Evaluation (POE) monitoring location above Pond B-1 (referred to as GS10) for the period April 13, 1997 through April 24,1997, and May 25, 1997 through June 20, 1997. The RFCA requires reporting of "exceedances in Segment 5" and when "standards are exceeded at a POC" with the submittal to the CDPHE and EPA of "a plan and schedule for source evaluation for the exceedance, including a preliminary plan and schedule for mitigating action". This Revision incorporates all comments from CDPHE and EPA (as of September 11, 1997) on the original Draft Plan submitted to Regulators on July 17, 1997.

2. DATA SUMMARY

As specified in the draft Surface Water Integrated Monitoring Plan (SW IMP), the Site's Water Management & Treatment (WM&T) group evaluates 30-day moving averages[1] for selected radionuclides at RFCA POEs and POCs. Recent evaluations of water-quality measurements at POC surface-water monitoring location GS03 (see Figure 2-1) show values above the POC Standard value of 0.15 pCi/L plutonium and americium. GS03 is located on Walnut Creek at Indiana Street. Results for 30-day moving averages using available data at GS03 are summarized below in Table 2-1 and are also plotted in Figure 2-2.

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[1] The 30-day average for a particular day is calculated as a volume-weighted average of a 'window' of time containing the previous 30-days which had flow. Each day has its own discharge volume (measured at the location with a flow meter) and activity (from the sample carboy in place that day). Therefore, there are 365 30-day moving averages for a location which flows all year. At locations which monitor pond discharges or have intermittent flows, 30-day averages are reported as averages of the previous 30 days of greater than zero flow. For days where no activity is available, either due to failed lab analysis or non-sufficient quantity for analysis (NSQ), no 30-day average is reported.

Table 2-1. Water-Quality Information from GS03 for the Period: 10/14/96-7/5/97.

Location	Parameter	Date(s) 30-Day Average Above 0.15 pCi/L	Date(s) of Maximum 30-Day Average	Maximum 30-Day Average (pCi/L)	Volume Weighted Average for Water Year to Date[2] (pCi/L)
GS03	Pu-239,240	6/12/97 - 7/2/97	6/13/97 - 6/24/97	0.465	0.038
GS03	Am-241	6/13/97 - 6/24/97	6/13/97 - 6/24/97	0.256	0.018

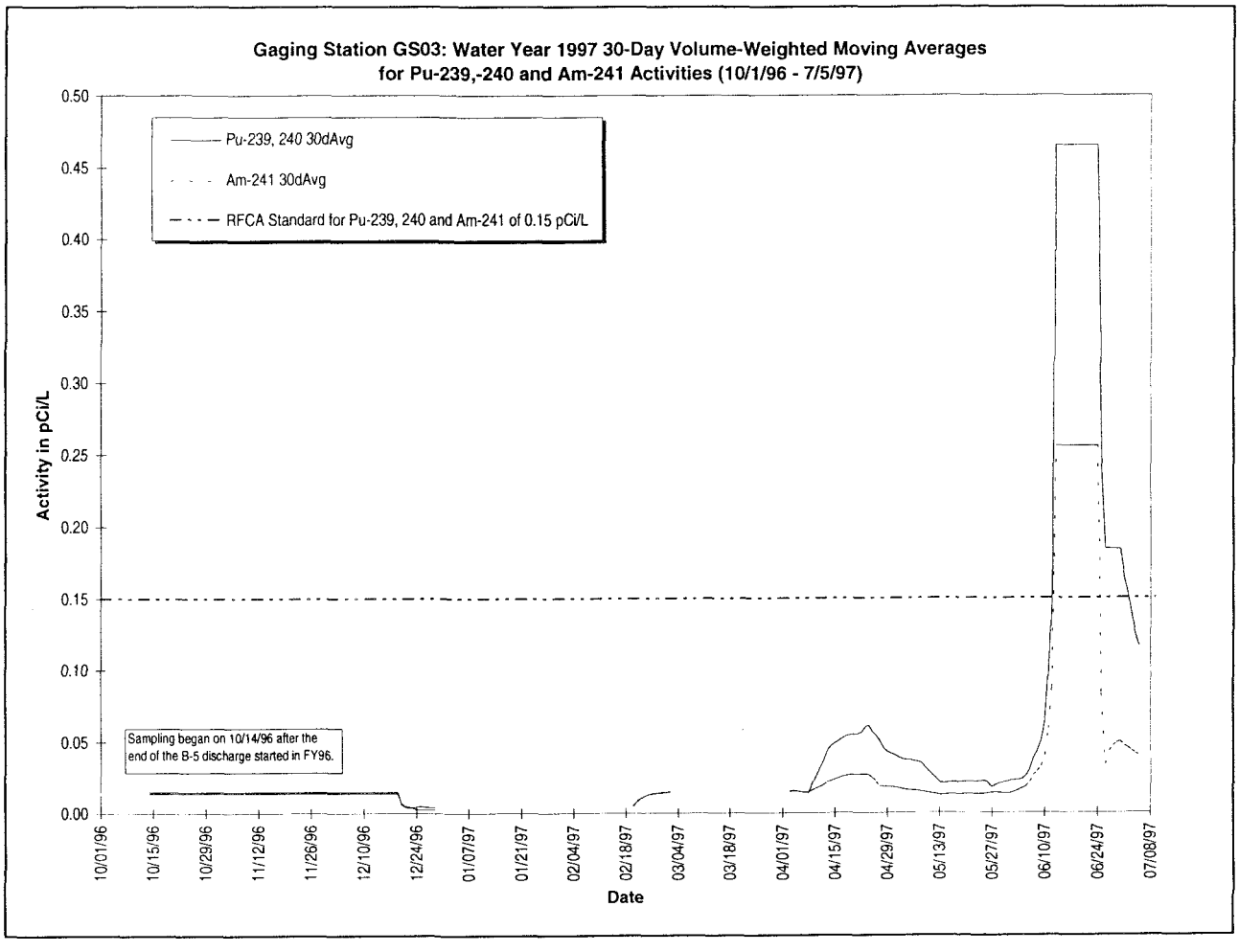

Figure 2-2. Gaging Station GS03 30-Day Averages: WY97 to Date

The individual analytical results for the composite samples collected around the period of these elevated 30-day averages have been reviewed and there is no reason to question their accuracy. Based on past analytical results for this location, these elevated values are considered unusual, with

[2] A water year (abbreviated as WY) is defined as the period October 1 through September 30.

historical measurements being well below 0.05 pCi/L [3]. Individual composite sample results and detail are shown in Table 2-2 for the period of interest.

Table 2-2. Selected Composite Sample Analytical Results for GS03.

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)	Walnut Cr. Discharge Volume During Sample Period (Million Gallons)
	Result	Error	Result	Error		
5/15 -6/25/97[a]	0.465	0.129	0.256	0.116	1.0	0.34
6/25 - 6/27/97	0.165[b]	0.052	0.018	0.021	8.0	2.83
6/27 - 7/1/97	0.184	0.046	0.056	0.036	8.6	5.37
7/1 - 7/6/97	0.000[c]	0.006	0.024	0.022	8.4	4.11

[a] Low sample volume (1 liter) due to dry weather and associated low flows. Accurate radio-analytical results cannot be obtained with sample volumes less than 4-liters.
[b] This is an arithmetic average for values of the first analytical run (0.206 pCi/L) and a rerun (0.124 pCi/L); error is the arithmetic average error.
[c] Actual result was -0.004 pCi/L for this sample; result is set to zero for practical reporting and calculation purposes.

The composite sample at GS03 for the period 5/15/97 - 6/25/97 was collected during baseflow conditions between Pond A-4 (the terminal pond for North Walnut Creek) discharges. It should be noted that this is a low volume sample (non-sufficient quantity), radio-analytical protocol recommends a minimum sample volume of 4-liters to produce accurate radio analytical results. The two composite samples at GS03 for the period 6/25/97 - 7/1/97 were collected as the first two-of-three composites during a Pond A-4 discharge (See Table 2-6 for Summary of Discharges from April through September 1997). Analytical results for composite samples from POC gaging station GS11 (Figure 2-1), which monitors controlled discharges from Pond A-4, show no elevated readings for Pu-239,240 or Am-241 for the discharges which occurred during 5/1/97 - 5/14/97 and 6/25/97 - 7/6/97. Table 2-3 summarizes these results.

During this time period, no off-normal conditions were noted in either decontamination and decommissioning (D&D), special nuclear material (SNM) stabilization or environmental cleanup activities that may have affected water quality, nor were there any closure activities occurring in the Walnut Creek drainage between Pond A-4 and Indiana Street. An initial walkdown of the Walnut Creek drainage between GS03 and Pond A-4 was conducted on August 15, 1997 and revealed no unusual conditions which might provide clues to elevated radionuclides in surface water for the May-July timeframe. Immediately downstream of station GS03 the water flowed offsite and was diverted around Great Western Reservoir, thus the downstream effect cannot be quantified. Pond A-4 discharges during this period showed normally low Pu and Am levels (as shown in Table 2-3). This information suggests that the source of the Pu and Am observed at GS03 is downstream of

[3] Historical values are available in the Site Annual Environmental Reports and the Quarterly Environmental Monitoring Reports.

Pond A-4 or located in a tributary to Walnut Creek in the Pond A-4-to-GS03 stream reach. This area has no known sources of significant contamination.

Table 2-3. Composite Sample Analytical Results for GS11 05/01/97-07/06/97:

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)	Pond A-4 Discharge Volume During Sample Period (Million Gallons)
	Result	Error	Result	Error		
5/1 - 5/6/97	0.006	0.004	0.005	0.007	17.4	14.61
5/6 - 5/8/97	0.006	0.005	0.002	0.006	6.8	3.85
5/8 - 5/14/97	0.006	0.004	0.003	0.005	10.6	7.16
6/25 - 6/27/97	0.002	0.005	0.009	0.011	9.4	3.42
6/27 - 7/1/97	0	0.012	0.004	0.017	4	5.67
7/1 - 7/6/97	0.003	0.012	0.009	0.012	7.8	4.22

This Plan also addresses the elevated 30-day moving average activities at gaging station GS10. GS10 receives flow from the central industrial area and monitors flow to south Walnut Creek via the B-1 bypass pipeline to Pond B-4 which flows into Pond B-5. Recent evaluations of water-quality measurements at POE surface-water monitoring location GS10 (located on South Walnut Creek just above Pond B-1; see Figure 2-1) show values above the POE Action Level of 0.15 pCi/L for Pu and Am. Results for 30-day moving averages using available data at GS10 are summarized below in Table 2-4 and are also shown on Figure 2-3.

The analytical results for the composite samples collected around the period have been verified. A review of historical monitoring data shows that these results are not unusual. Storm-event samples collected at GS10 from 1992 through 1996 (under pre-RFCA protocols) had an arithmetic average Pu-239,240 activity of 0.23 pCi/L with a maximum of 1.4 pCi/L. The apparent trend upward during FY97 is likely due to seasonally increasing flow rates which carry increased suspended material. To the best of our knowledge, during this time period no off-normal conditions were experienced at any D&D, SNM stabilization or environmental cleanup activities that could have affected water quality.

Table 2-4. Water-Quality Information from GS10 for the Period: 10/1/96-7/7/97.

Location	Parameter	Date(s) 30-Day Average Above 0.15 pCi/L	Date(s) of Maximum 30-Day Average	Maximum 30-Day Average (pCi/L)	Volume Weighted Average for Water Year to Date (pCi/L)
GS10	Pu-239,240	4/13/97 - 4/24/97 5/25/97 - 6/20/97	6/5/97	0.262	0.116
GS10	Am-241	5/25/97 - 6/14/97	6/5/97	0.215	0.09

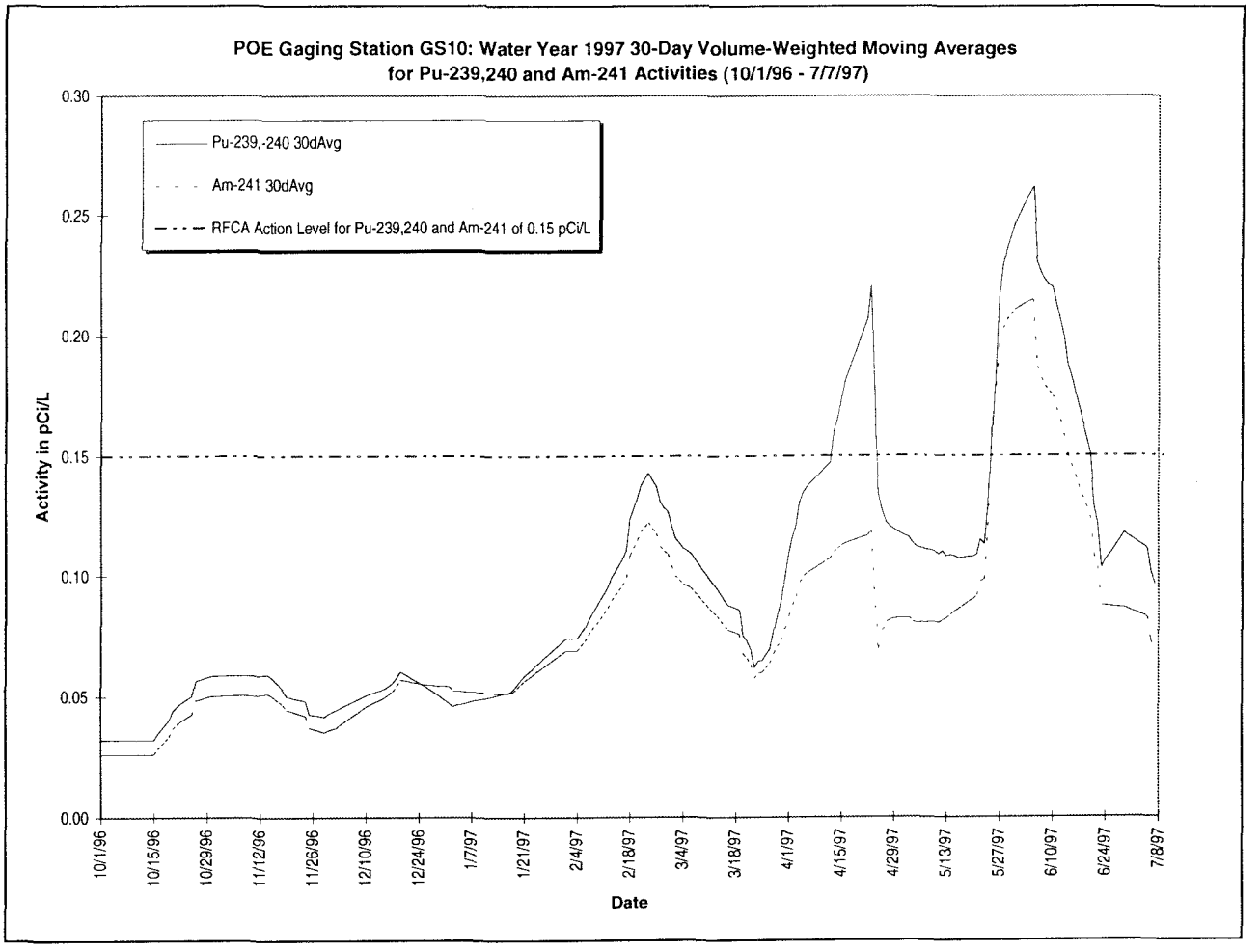

Figure 2-3. Gaging Station GS10 30-Day Averages: WY97 to Date

All water monitored at GS10 subsequently flowed to Pond B-5 and was transferred to Pond A-4, and Pond A-4 was subsequently discharged to Walnut Creek. Pre-discharge samples of the water in Pond A-4 indicated acceptable water quality for all discharges. Analytical results from composite samples collected at gaging station GS11 at the Pond A-4 outfall during each discharge were well below the RFCA standard (see Table 2-3). This improvement in water-quality indicates that the Site's water-management practices help remove contaminants. Individual composite sample results and detail for GS10 are shown in Table 2-5 for the period of interest.

Table 2-5. Composite Sample Analytical Results for GS10 03/28/97-06/08/97.

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)	S. Walnut Cr. Discharge Volume During Sample Period (Million Gallons)
	Result	Error	Result	Error		
3/28/97 - 4/2/97	0.300	0.026	0.140	0.015	6	0.29
4/2/97 - 4/11/97	0.150	0.017	0.110	0.021	8.8	1.37
4/11/97 - 4/24/97	0.410	0.041	0.140	0.019	12.2	2.36
4/24/97 - 4/25/97	0.086	0.014	0.045	0.009	12.8	1.64
4/25/97 - 4/26/97	0.070	0.012	0.033	0.009	10.8	2.39
4/26/97 - 5/12/97	0.086	0.014	0.120	0.017	4	2.67
5/12/97 - 5/25/97	0.380	0.049	0.300	0.044	7.4	1.19
5/25/97 - 6/8/97	0.134	0.043	0.106	0.053	9.6	1.66

Table 2-6. Summary of Discharges for 4/3/97-9/8/97.

Location	Discharge Dates	Volume Discharged (gal)
Pond A-4	4/3/97 - 4/13/97	13,609,000
Pond B-5	4/28/97 - 5/12/97	15,450,000
Pond A-4	5/1/97 - 5/14/97	25,616,000
Pond A-4	6/25/97 - 7/6/97	13,319,000
Pond A-4	8/5/97 - 8/7/97	4,000,000 *est.
Pond A-4	8/29/97 - 9/8/97	19,000,000 *est.

- Final record of volume discharged not yet complete.

3. SOURCE EVALUATION

This Plan describes separate source evaluation actions for Walnut Creek gaging stations GS03 and GS10. Source evaluations are required to determine the location, extent, and significance of areas which may have an impact on surface water quality. Source evaluations require analysis of constituent fate, transport, and loading, as well as statistical analysis and the establishment of water-quality correlations which may indicate the location of a contaminant source. Source Evaluation Progress Reports will be produced at intervals during the source evaluation process as specific actions are completed (see Section 7). Such actions will be completed promptly or incorporated into the Environmental Restoration ranking and Site prioritization systems if substantial costs are anticipated. A preliminary discussion of proposed mitigating actions that may be appropriate for

source locations in Walnut Creek is included in Section 3.2.5 of this report. A schedule of deliverables is included in Section 7.

3.1. Source Evaluation for RFCA POC GS03

3.1.1. Continuation of RFCA Monitoring

Flow-paced sampling at GS03 and the terminal Ponds GS11 and GS08, (Figure 3-1) will continue as specified by the SW IMP. However, composite collection frequency at GS03 for periods of baseflow (intervals between terminal pond discharges) will be doubled from 1 to 2 carboys per baseflow period. This protocol modification will reduce the chance of collecting composites with insufficient volume for analysis and help assure that at least one composite sample is available for the calculation of 30-day moving averages.[4] Future RFCA analytical information will be used to evaluate for trends in the 30-day moving average values at GS03. This information may indicate water-quality patterns which lend insight into the cause of the recent elevated values measured at GS03. Since results at GS03 have been near detection for the last several years, subsequent analytical results could provide information about the significance of the value from this period.

3.1.2. Walk-Down of Drainage Area

A walk-down of the GS03 area will be used in an effort to visually identify conditions which may indicate source areas. Conditions which might indicate a potential source area include the following items:

1. Existence of man-made materials in drainage pathways;
2. Areas of concentrated fine sediments in drainage pathways;
3. Areas which contribute significant quantities of runoff sediment (e.g., steep dirt roads, barren hillsides, and slopes needing revegetation);
4. Erosion on radionuclide-related IHSSs;
5. Position of radionuclide-related IHSSs in relation to storm water drainage pathways; and
6. Overall condition of storm drainage pathways.

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[4] The draft IMP specifies that one (1) composite sample be collected at GS03 during periods of baseflow between terminal pond discharges. At the end of a baseflow period, this composite must be removed from the sampler so it consists solely of baseflow grabs. The expected flow during a baseflow period must be predicted based on historic baseflow record. The sampler is then flow-paced based on this predicted flow such that a sufficient quantity of water is collected for analysis (≈ 4 liters). If the actual flow during this period is significantly less than predicted (dry weather conditions), then the sampler may not collect a sufficient volume for analysis. At other RFCA locations, the composite may be left in place to continue filling, but at GS03 composites must be pulled based on the time constraint of scheduled terminal pond discharges.

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3.1.3. Assessment of Existing Environmental Data

Existing environmental information will be statistically evaluated for trends and correlations which may indicate the locations of source areas where mitigating action would be beneficial. Fate, transport, and loading analysis will be performed where appropriate. Each type of environmental information will be assessed both individually and in conjunction with any other information including water quality parameters which may provide insight. The actions for each information resource are detailed below.

Automated Surface-Water Monitoring Data

A complete data set will be presented of automated data collected under the Event-Related Surface-Water and RFCA Monitoring Programs at gaging stations GS03, GS08, and GS11. Summary statistics and data presented will include flow rates, discharge volumes, Pu and Am activities, TSS, and water quality parameters that may show correlation with the analytical results. Particular attention will be given to the various sampling protocols such that comparisons are meaningful. A discussion will be included regarding the sampling protocols employed by the Site's automated monitoring programs. Calculations will be performed to estimate monthly and annual loading rates for Pu and Am, and the gains/losses for these constituents in the reach between the terminal ponds and the east Site boundary. Qualitative consideration will be given to other environmental variables which may influence water-quality such as time of year and storm-event characteristics.

Sitewide Surface-Water Data

Analysis of historic reports and data will provide the basis for surface-water data investigation. Existing reports on surface-water characterization (e.g., Surface Water and Sediment Geochemical Characterization Reports) and monitoring (e.g. Event-Related Surface Water Monitoring Reports) will be compiled and reviewed for information which will aid the Walnut Creek source investigation. Historic surface-water radioanalytical data for locations tributary to GS03 will compiled and analyzed. Summary statistics, trend plots and maps will be prepared to aid the investigation. This information will be presented with a qualitative discussion of data-set completeness, trend analysis, and relevance of any anomalous values as they relate to identifying potential Walnut Creek radiological sources. Recommendations will be made for collection of additional data if necessary.

Data Generated by Recent Site Projects

Site closure activities being conducted upstream from Station GS03 at the time of, or just prior to, the period of interest will be analyzed. Activities that could potentially impact surface water, including building D&D, SNM stabilization, environmental remediation projects, excavation work, and routine day-to-day operations, will be reviewed.

For each Site closure activity identified as potentially relevant to this investigation, the following information will be provided:

- Scope of activity;
- Contaminants of concern;
- Project-specific environmental monitoring data (where available);
- Project-specific engineering controls in place; and
- Administrative controls.

Gamma Spectroscopy Information

Data will be reviewed from the Industrial Area Operable Unit gamma spectroscopy survey, conducted in 1993 and 1994, that utilized High Purity Germanium (HPGe) detectors. The HPGe instrumentation was used to measure Americium-241 activities in Industrial Area surficial soil materials. Limitations of this analytical method will be recognized. The data set will be reviewed with consideration that building "shine" (from stored radioactive materials) can potentially impact results and that small, localized sources may be undetected.

Soil and Sediment Information

Analysis of historical reports and data will provide the basis for the sediment and soils investigation. Existing reports on sediment and soil investigations and the RFI/RI Operable Unit-6 Report (Walnut Creek Priority Drainage) will be compiled and reviewed for information which will aid the Walnut Creek source investigation. Historical surface-water radioanalytical data for locations in the GS03 drainage will be compiled and analyzed. Summary statistics, trend plots, and maps will be prepared to aid the investigation. This information will be presented with a qualitative discussion of data set completeness, trend analysis, and relevance of any anomalous values as they relate to potential Walnut Creek radiological sources. Recommendations will be made for collection of additional data if necessary.

Historical Release Report Information

The Historical Release Report, and its annual updates provides a listing of all known spills, releases, and incidents involving hazardous substances occurring since the Rocky Flats Plant began operations in 1951. Based on information in this document, a summary of historic releases to Walnut Creek and changes to Walnut Creek ponds and drainages will be compiled and assessed. The history of "Pond A-5", including dates of construction and modification, will receive particular attention because of its location immediately upstream from station GS03.

Groundwater Data

Subsurface water-quality data for the Site-boundary well #41691, just down-gradient from GS03, will be compiled and considered in relation to surface water quality trends. Sampling results from three recently installed monitoring wells in the vicinity of GS03 will also be assessed. Particular attention will be given to well installation and sampling techniques as they relate to the character of the samples and applicability of the results. Finally, any noteworthy trends in radiological subsurface-water quality upgradient from GS03 will be identified and considered. Summary statistics of the relevant information will be compiled and presented in conjunction with a qualitative discussion of possible relationships between groundwater quality and recent surface-water sampling results at GS03.

3.1.4. Collection and Assessment of Additional Environmental Data

Soil and Sediment Sampling

Analytical results from at least nineteen (19) new monitoring locations (shown on Figure 3-1) will be evaluated. Sediments from the pond at Walnut and Indiana and the drainage pathways tributary to GS03 will be analyzed for spatial variability that may indicate the location of a source area. Summary statistics for these new values will be evaluated against historical results to indicate changes. Additionally, these values will be compared to surface-water radionuclide activities in a mass loading context.

Additional soil and sediment sampling is anticipated to support ongoing source evaluations. These samples will be targeted to further define any localized source areas.

Synoptic Surface-Water Sampling

Analytical results from seven (7) temporary monitoring locations will evaluated (Figure 3-1). These locations were used to synoptically sample the first 24 hours of an A-4 discharge (8/29-8/30) at various locations along Walnut Creek between Pond A-4 and GS03. Automatic samplers were used to collect 75 time-paced grabs in a 15-liter carboy. The samplers were spaced along Walnut Creek to determine spatial variability in water quality. Each sampler was started as the discharge reached them, effectively sampling the same 'plug' of water. Each composite sample was analyzed for total radionuclides, total metals, dissolved metals, total suspended solids/total dissolved solids (TSS/TDS), hardness, and sand silt split. Additionally, field grab samples for total organic carbon/dissolved organic carbon (TOC/DOC) were collected at the start time of each composite sample. Surface-water radionuclide activities from these samples will be analyzed for spatial variability using loading analysis which may indicate the location of a source area. Correlations between radionuclide activities and other water-quality results will be evaluated and may indicate transport mechanisms and location of source areas. Summary statistics for these new values will be evaluated against results from GS03 and GS11.

Additional synoptic sampling may be conducted to support ongoing source evaluations. These samples will be targeted to further define any localized source areas.

Continuous Sampling and Evaluation of Walnut Creek Tributaries

Additional upstream monitoring locations will be installed to continuously sample surface-water flows and further delineate the GS03 tributaries. Initially, new locations are proposed for No Name Gulch at Walnut Creek, McKay Ditch at Walnut Creek, Walnut Creek just upstream of the McKay confluence, and Walnut Creek just upstream of the pond at Walnut and Indiana (Figure 3-1). These locations will employ flow-control devices (e.g., flumes, weirs) and continuous flow-paced sampling to define mass transport and determine which sub-drainages are contributing contaminants. Water-quality information from sub-drainages may also indicate

the degree to which source areas are localized or wide-spread. Additional monitoring locations may be installed to support the ongoing source evaluations. These locations will be targeted to further define any localized source areas.

Groundwater Sampling

Additional groundwater samples may be collected from existing or new wells with need based on the ongoing source evaluations. These samples will be targeted to further determine any localized source areas.

3.1.5. Actinide Migration Study

The Site is currently involved in a comprehensive multi-year study to improve understanding of the behavior and transport of actinides (esp. Pu, Am, U) in the environment. This understanding of actinide migration should provide insight into the nature and movement of potential sources. The major goals of actinide migration studies are:

1. Assess the long-term protectiveness of the actinide soil action levels on surface water;
2. Design remedial actions that minimize actinide migration after Site closure and are protective of surface water quality; and
3. Understand the actinide environmental transport mechanisms by refining the Conceptual Model (see Attachment 1 of the Path Forward for Actinide Migration, June 1997).

The Actinide Migration Study information will be similarly incorporated in both the GS10 and GS03evaluations.

A summary of relevant findings from the Actinide Migration Study that are available will be included in each Source Evaluation Progress Report. Transport mechanisms identified by the Study will be used in the source evaluation to help locate potential source areas. The source evaluations will be conducted in cooperation with the investigators working on the Study, and their expertise will be regularly solicited.

3.1.6. Watershed Improvements

Studies indicate that, when sources are available, radionuclides may associate with solids suspended in storm water. Based on these characteristics of radionuclides and storm water, it is inferred that removing particulate material from storm water runoff should remove radionuclide loading from the water. Watershed improvements have been implemented at RFETS in FY96 and FY97 in order to stabilize and entrap soils and sediments likely to be transported from the watershed by storm water runoff.

Watershed improvements implemented during the past two years in the drainage basin upstream from GS03 will be identified. Surface water monitoring results from stations located immediately downstream from these improvements will also be presented.

3.2. Source Evaluation for RFCA POE GS10

3.2.1. Continuation of RFCA Monitoring

Flow-paced sampling at GS10 and SW022 (upstream of GS10; Figure 3-2) will continue as specified by the SW IMP. Future analytical results will be correlated with trends in the 30-day moving average values at GS10. This information may indicate water-quality patterns that could provide insight into the causes of the current values being measured at GS10.

3.2.2. Walk-Down of Drainage Area

Walk-downs of the contributing drainage areas will be used in an effort to visually identify conditions which may indicate source areas. Conditions which might indicate a potential source area are the same as those for GS03.

3.2.3. Assessment of Existing Environmental Data

Existing environmental information will be statistically evaluated for trends and correlations which may indicate the locations of source areas where mitigating action would be beneficial. Fate, transport, and loading analysis will be performed where appropriate. Each type of environmental information will be assessed both individually and in conjunction with any other information which may provide insight. The actions for each information resource are detailed below.

Automated Surface-Water Monitoring Data

A complete data set will be presented of automated data collected under the Event-Related Surface-Water Monitoring and RFCA Monitoring Programs at gaging stations GS10, SW022, GS27 and GS28 (Figure 3-2). Gaging stations GS27 and GS28 were used as Performance Monitoring locations which monitored the sub-drainage potentially impacted by the Building 889 D&D activities. This sub-drainage is tributary to SW022, and subsequently GS10. Summary statistics and data presented will include flow rates, discharge volumes, Pu and Am activities, and TSS. Particular attention will be given to the various sampling protocols such that comparisons are meaningful. Calculations will be performed to estimate monthly and annual mass loading rates for Pu and Am, and the gains/losses for these constituents in the reach between the monitoring locations of concern. Qualitative consideration will be given to other environmental variables which may influence water-quality such as time of year and storm-event characteristics.

Sitewide Surface-Water Data

Existing surface-water data for locations tributary to GS10 will be evaluated as with GS03 (see section 3.1.3).

Data Generated by Recent Site Projects

Site closure activities being conducted upstream from Station GS10 at the time of, or just prior to, the period of interest will be analyzed. Activities that could potentially impact surface water, including building D&D, SNM stabilization, environmental remediation projects, excavation work, and routine day-to-day operations, will be subject to review.

Similar to the GS03 study, the GS10 investigation will provide the following information for each Site closure activity identified:

- Scope of activity;
- Contaminants of concern;
- Project-specific environmental monitoring data (where available);
- Project-specific engineering controls in place; and
- Administrative controls.

Gamma Spectroscopy Information

The GS10 study, similar to the GS03 source investigation, will include a review of data from the Industrial Area Operable Unit gamma spectroscopy survey. Americium-241 sources detected by the survey and located within the GS10 drainage will be identified. Limitations of this analytical method, as noted in the GS03 investigation text, will be recognized when reviewing this data.

Soil and Sediment Information

Existing soils and sediment data for locations within the GS10 drainage will be evaluated as for GS03 (see section 3.1.3).

Historical Release Report Information

A summary of historic releases to South Walnut Creek, based on information contained in the Historical Release Report, and annual updates, will be compiled. Past work activities in the section of South Walnut Creek south of Building 995, immediately upstream from GS10, will receive particular attention.

Groundwater Data

Subsurface water-quality records for the groundwater monitoring wells proximal to GS10 will be compiled and assessed in relation to surface-water quality trends. Particular regard will be given to well installation and sampling techniques as they relate to the character of the samples and applicability of the results. Finally, any noteworthy trends in radiological subsurface water quality upgradient from GS10 will be identified and considered. Summary statistics of the relevant information will be compiled and presented in conjunction with a qualitative discussion of possible relationships between groundwater quality and recent high Pu and Am concentrations recorded in surface water at GS10.

3.2.4. Collection and Assessment of Additional Environmental Data

Groundwater Sampling

Additional groundwater samples may be collected from existing or new wells based on the ongoing source evaluations. These samples will be targeted to further define any localized source areas.

Soil and Sediment Sampling

Soil and sediment samples will be collected from the drainage tributary to GS10. Locations of these samples will be determined based on the analysis of existing data. These locations will be sited to indicate spatial sediment/soil activity variations and to fill any gaps in existing data. Sediment/soil activities from the drainage pathways tributary to GS10 will be analyzed for spatial variability which may indicate the location of a source area. Summary statistics for these new values will be evaluated against historical results in the area to indicate changes. Additionally, these values will be compared to surface-water radionuclide activities in a loading context.

Additional soil and sediment sampling is anticipated in support of the ongoing source evaluations. These samples will be targeted to further define any localized source areas.

Continuous Sampling and Evaluation of South Walnut Creek Tributaries

Additional upstream monitoring locations will be installed to continuously sample surface-water flows to further delineate the GS10 tributaries. Monitoring locations will be determined based on the analysis of existing data to further scrutinize the GS10 drainage basin. These locations will employ flow control devices (e.g. flumes, weirs) and continuous flow-paced and/or synoptic storm-event sampling to calculate mass transport to determine which sub-drainages may be contributing contaminants. Water-quality information from sub-drainages may also indicate the degree to which source areas are localized or wide-spread. Initially, perhaps two to three locations might be considered as a first step to investigate the GS10 drainage basin. Additional

monitoring locations may be installed to support the ongoing source evaluations. These locations will be targeted to further determine any localized source areas.

3.2.5. Watershed Improvements

Watershed improvements implemented in the GS10 drainage basin during the past two years will be identified. Surface water monitoring results from stations located immediately downstream from these improvements will also be presented.

4. PRELIMINARY PROPOSAL FOR MITIGATING ACTIONS FOR SOURCE AREAS

The following sections describe mitigating actions which will be considered to control or remove potential source areas. Mitigating actions will be proposed in a Mitigating Action Plan should source evaluations prove conclusive and source areas be sufficiently localized such that mitigating actions would be effective and appropriate. These mitigating actions will be based on the results of the source evaluation process. Such actions will be completed, as practicable, or incorporated into the ER and Site prioritization systems if substantial costs are anticipated.

4.1.1. Watershed Improvements

Over the past two fiscal years, interim erosion control measures ('watershed improvements') have been implemented at RFETS in an effort to stabilize and entrap potentially contaminated soils and sediments likely to be transported from the watershed by stormwater runoff. Implementation of these measures is based on studies that indicate, when sources are available, radionuclides may associate with solids suspended in stormwater. Stormwater data collected at the Site between 1991 and 1995 supports this conclusion. Based on these associations of radionuclides with stormwater, reduction of particulate material in stormwater runoff should reduce radionuclide loads. As outlined above, drainage areas targeted for control measures (source areas) are those locations identified as most likely to contribute material that could provide a transport mechanism for radionuclides in Site runoff.

Two types of watershed improvement measures are available. Hydraulically-applied erosion control products can be utilized[5] to stabilize soils and silt fences or catch basins can be installed to capture sediments suspended in runoff.

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[5] The Site currently uses SoilGuard® and TopSeal® products.

4.1.2. Physical Source Removal

If a source is localized or discrete enough to be considered a 'hot spot', ER personnel could physically remove the contaminated soils or sediments. These sources would then be containerized for storage and disposal. Such mitigating actions will be completed promptly, or incorporated into the ER ranking and Site prioritization systems if substantial costs are anticipated.

5. OPERATIONAL PROTOCOL MODIFICATIONS

5.1.1. Modification in Reporting Protocols

Accurate Initial Reporting

Administrative controls will be evaluated and modified as needed to facilitate the expeditious release of information and better assure prompt reporting.

Presentation of Facts

Initial reports will be only factual in nature. Analysis and interpretation will be reserved for subsequent reports and action plans.

5.1.2. Modifications in Sampling Protocols

Although FY97 sample results are considered valid, certain modifications to sampling protocols will be implemented to further reduce the possibility of cross-contamination and incomplete sample collection. Implementation of new RFCA monitoring protocols are being phased in and refined throughout FY97, and modifications are expected.

Winter Freeze Protection

POC gaging stations in Walnut Creek will be evaluated for winter freeze protection including outfitting with submersible heat tape/coils or other modifications to reduce the possibility of sample intake line freezing and the attendant gaps in sample collection. Electrical systems (AC) will likely need to be upgraded at these locations to accommodate the increased power requirements. (Historically, aging line power already in place at these locations has shown reliability problems.) Freeze protection for Woman Creek stations will be considered, but the cost to run line power to GS01 (Woman Creek & Indiana Street) is expected to be substantial.

Cross-Contamination Risk Reduction

Although FY97 sample results are considered valid, certain modifications to sampling protocols may be considered to further reduce the risk of cross-contamination. The following modifications in protocol may be implemented:

1. All sampling container lids will be stored in zip-lock bags at the monitoring location to reduce the possibility of contamination by air pathways; and
2. All RFCA POC will have dedicated sample container washing tools.

Increase in Baseflow Sample Frequency at GS03

Current sampling protocols call for the collection of one flow-paced composite sample at GS03 for the baseflow periods between terminal pond discharges. Although the collection of a single carboy is acceptable to characterize water-quality and satisfy SW IMP decision rules as determined by the data quality objectives (DQO) process, composite collection frequency at GS03 will be doubled from 1 to 2 carboys per baseflow period. This protocol modification will reduce the chance of collecting composites with insufficient volume for analysis and assure that at least one composite sample is available for calculation of the 30-day moving averages.

Decrease in Sample Turn-Around Time at RFCA Points of Compliance

Currently the majority of isotopic plutonium, americium and uranium analyses are completed with a routine 30-35 day turnaround. An accelerated or rapid turnaround of 2 weeks for the same analytes increases costs approximately 25-50%. If all (approximately 33 for FY98) samples from GS03 were submitted to the analytical laboratory for rapid or 2 week turnaround, the estimated cost for FY98 would also be approximately 25-50% higher than for routine work. The Site's Analytical Projects Office maintains that the subcontracted labs have agreed to analyze surface-water samples requiring various turnaround times, and as such, analytical quality should not be affected by requesting 2-week turnaround's for some samples. If some RFCA locations require shorter turnaround and samples collected during a given time frame (for example, every 2 weeks) could be batched prior to shipment, greater analytical efficiencies could be realized. If, however, individual samples are shipped as collected, and the laboratory does not batch samples together after receipt, the efficiency of the lab will be reduced and both turnaround time and quality could be impacted. The estimated additional costs to accommodate 2-week turnaround for all current RFCA POCs in FY98 is projected to be $10-15k.

The current labs under subcontract with the APO are meeting the Statement of Work required detection levels of 0.03 pCi/L for Pu and Am using between 1.5-2.0 liters of water. Increasing the volume of water used for analysis would reduce the detection levels, or minimum detectable activity (MDA), but would extend the analysis time as a larger quantity of water would require concentration (boiling down in a very controlled manner) prior to analysis. This could impede meeting a 2-week turnaround. Another way to increase or enhance MDA is to increase sample

counting time, however, it would also extend the overall analysis time and could prevent the labs meeting the 2-week requested turnaround.

6. DELIVERABLES

In order to allow sufficient time for effective source evaluation, while simultaneously providing the more frequent dissemination of information and results as they become available, a series of deliverables in the form of reports or plans is proposed. During the production of each report, additional data will be collected which will be included in subsequent reports. The scope of additional data collection will be made flexible and should be expected to change based on the knowledge gained during the source evaluation activities. Such data collection actions will be completed promptly, or incorporated into the ER ranking and Site prioritization systems if substantial costs are anticipated. Since the initial draft Plan was produced (June 1997), the project scope has increased significantly due to recent (June-July) elevated measurements at GS03. Therefore, three Source Evaluation Progress Reports, and one Final Source Evaluation and Mitigating Action Plan will be produced. The content of each report is detailed below, and the schedule is given in Section 7.

6.1. Source Evaluation Progress Report #1

The Source Evaluation Progress Report #1 will include the assessment of current existing monitoring data primarily for GS03 and information requested by CDPHE. The following will be included in this Report for Walnut Creek:

- An evaluation of sampling and analysis QA/QC protocol to verify elevated water-quality results.
- Matrix of hypotheses for source location(s) with supporting and non-supporting information, including preliminary results on source location;
- Results and analysis of ongoing RFCA monitoring (see section 3.1.1);
- A summary of walk-down activities and observations (see section 3.1.2);
- A statistical assessment of existing monitoring data (see section 3.1.3);
- A summary of current Actinide Migration Study findings with cross-links to source evaluations (see section 3.1.5);
- Details on the new monitoring locations upgradient of GS03 and GS10 (see sections 3.1.4 and 3.2.4);
- An initial qualitative evaluation for GS10;
- A discussion of the recent change from rising-limb to continuous flow-paced sampling at RFCA POE and POC locations;
- A summary of the status for sampling and operational modifications (see Section 5);
- A discussion of the water quality parameters; and
- An overlay of GS03 and GS10 data with a discussion of spatial and tempural differences as they relate to analytical results.

6.2. Source Evaluation Progress Report #2

The Source Evaluation Progress Report #2 will include the assessment of current existing monitoring data for GS10, and any new data from GS03. The following will be included in this Report for Walnut Creek:

- Matrix of hypotheses for source location(s) with supporting and non-supporting information, including preliminary results on source location;
- Results and analysis of ongoing RFCA monitoring (see sections 3.1.1 and 3.2.1);
- A summary of walk-down activities and observations for GS10 (see section 3.2.2);
- An assessment of existing monitoring data for GS10 (see section 3.2.3);
- A detailed description of new sediment/soil sampling locations for GS10 (see section 3.2.4);
- An assessment and incorporation of available new data for GS03 (see section 3.1.4);
- A summary and of current Actinide Migration Study findings with cross-links to source evaluations (see section 3.1.5); and
- A summary of the status for sampling and operational modifications (see Section 5).

6.3. Source Evaluation Progress Report #3

The Source Evaluation Progress Report #3 will include the assessment of all available monitoring data for GS03 and GS10. The following will be included in this Report for Walnut Creek:

- Matrix of hypotheses for source location(s) with supporting and non-supporting information, including preliminary results on source location;
- Results and analysis of ongoing RFCA monitoring (see sections 3.1.1 and 3.2.1);
- An assessment and incorporation of available new data for GS03 and GS10(see sections 3.1.4 and 3.2.4);
- An evaluation of the effects that watershed improvements may have had on water quality at GS03 and GS10 (see section 3.1.6);
- An identification and quantification of downstream effects from any identified source;
- An identification of data gaps and uncertainties in the source evaluation process with suggested modifications (if any) to the Actinide Migration Study Workscope and the SW IMP; and
- A summary of the status for sampling and operational modifications (see Section 5).

6.4. Final Source Evaluation Report and Mitigating Action(s) Plan

Mitigation actions will be proposed in a Mitigating Action(s) Plan should source evaluations be successful and indicate that mitigation would be effective in improving water quality. If source evaluations prove inconclusive, additional evaluation will be considered. Mitigation actions will be targeted and designed based on the results of the source evaluation actions. Such actions

will be completed promptly or incorporated into the ER ranking and Site prioritization systems if substantial costs are anticipated. The following will be included in the Final Evaluation Report and Mitigating Action Plan for Walnut Creek:

- Results of the source location evaluation;
- A detailed description of identified source areas;
- A detailed description of mitigating actions applicable to each identified source area; and
- Scope, schedule, and budget for the proposed mitigating actions.

7. SCHEDULE

Deliverable	Completion Date
Source Evaluation Progress Report #1	September 30, 1997
Source Evaluation Progress Report #2	November 17, 1997
Source Evaluation Progress Report #3	December 31, 1997
Final Source Evaluation Report and Mitigating Action Plan	April 15, 1998

Figure 3-1

GS03 Drainage Area (Lower Walnut Creek)

August 1997

Legend

Gaging & Sampling

- ▲ Gaging Station (Point of Compliance)
- New Gaging Station Location
- ○ Sediment Sampling Location (Location Code Shown)
- Synoptic Sampling Location (Aug. 29 - Aug. 30, 1997)

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95.
Topology (contours) were derived from digital elevation model (DEM) data by Morris K (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was capture by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at 10 (?) meter resolution. The DEM post-processing performed by MK, Winter 1997.

Scale = 1 : 5160
1 inch represents 430 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

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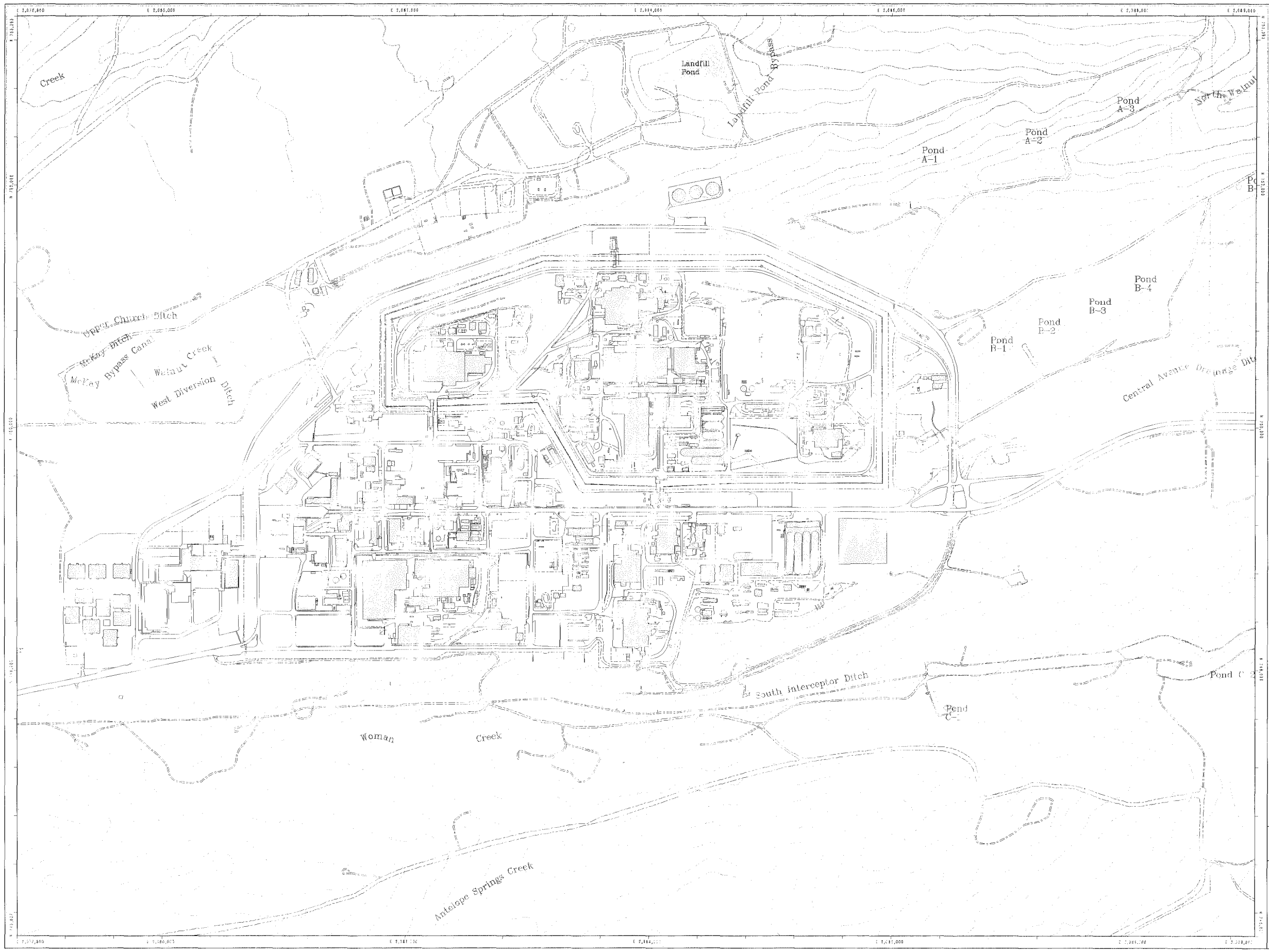
MAP ID: 07-0188-GS03 September 11, 1997

/gis2/projects/fy97/97-0188/gs03-sm pl-fig3-1.ami

Figure 3-2

GS10 Drainage Area (and Selected SW Monitoring Locations)

August 1997



Legend

Gaging & Sampling Stations

- Surface Water Monitoring Location

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSI, Las Vegas.
Digitized from the orthophotographs, 1:35
Topology (contours) were derived from digital elevation model (DEM) data by Morris K (MK) using ESRI Arc / IN and LATTICE to process the DEM data to create 5-foot contours.
The DLM data was capture by the Remote Sensing Lab, Las Vegas, NV, 1994. Aerial Flyover at 10 (?) meter resolution.
The DEM post-processing performed by MK, Winter 199 /.

Scale = 1 : 9790
1 inch represents approximately 816 feet

2500 0 500 1000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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